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Reassessing the association between facial structure and baseball performance: a comment on Tsujimura & Banissy (2013)

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Are the associations between the facial width-to-height ratio (fWHR) and Japanese male baseball player performance documented by Tsujimura & Banissy [1] robust to controlling for body mass index (BMI)? Two factors motivate this question. First, research suggests that BMI is positively associated with both home run hitting [2,3] and fWHR [4,5]. Second, recent research has suggested that body size, not facial fWHR, predicts outcomes among male professional hockey players [6,7].

Regression analysis is used to re-assess the positive associations between fWHR and home runs, runs-batted-in and slugging percentage [1] while controlling for BMI. Poisson estimation is used for the count-based performance metrics of home runs and runs-batted-in, while ordinary least-squares estimation is used for the continuous performance variable slugging percentage [8]. Player performance, fWHR and number of at-bats are from Tsujimura & Banissy [1]. BMI is calculated as (weight/height^2) $\times$ 703. Player weight (in pounds) and height (in inches) are obtained from www.baseball-reference.com, which is also used to collect data on player age, whether a player bats right-handed and the player's team. Controlling for handedness is important given right-handed individuals exhibit higher levels of circulating testosterone [9]. Including team indicator variables alleviate stadium effects and home field advantage [10] that can impact player performance. For example, if an outfield fence of a given stadium is relatively closer to home plate, the team calling that stadium home will play more games there than other teams, thereby increasing home run hitting potential.

The data contain 206 player-year observations across the two seasons analysed, representing 125 unique players (data available as electronic supplementary material). The Pearson correlation between fWHR and BMI for this set of unique players is positive and statistically significant ($r(125) = 0.218$, $p = 0.015$), suggesting the potential for confounding BMI effects. Columns (A) and (D) in panel I of table 1 show a positive and statistically significant association between home runs hit and fWHR in both the 2011 (coefficient = 3.384, $p < 0.01$) and 2012 (coefficient = 2.445, $p < 0.01$) seasons, after controlling for lognormalized at-bats and player age [1]. Column (B) and (E) introduce BMI as an additional control. The coefficient on BMI is positive and statistically significant in both the 2011 (coefficient = 0.176, $p < 0.01$) and 2012 (coefficient = 0.154, $p = 0.01$) seasons, and fWHR is no longer a statistically significant home run predictor. In columns (C) and (F), batting handedness and player team do not impact the association between BMI and home runs hit, and fWHR remains statistically insignificant.

Panel II in table 1 repeats the analysis of panel I, but instead estimates determinants of runs-batted-in. Columns (A) and (D) document a positive and statistically significant association between fWHR and runs-batted-in [1]. However, including controls for BMI in columns (B) and (E) renders fWHR statistically insignificant, while BMI itself exhibits a positive and significant coefficient in both 2011 and 2012. The BMI coefficient is not meaningfully

Table 1. Player performance as a function of fWHR, base 10 logarithm of at-bats, age, body mass index, batting handedness and team employing the player. Heteroskedasticy robust s.e. clustered by team are presented in parentheses. Statistically significant levels are indicated by asterisks.

	2011 season			2012 season		
	(A)	(B)	(C)	(D)	(E)	(F)
panel I: home runs hit estimated via Poisson regression						
intercept	−13.092 (1.648)***	−14.739 (1.620)***	−14.917 (2.859)***	−10.527 (1.581)***	−12.048 (0.688)***	−11.256 (0.369)***
fWHR	3.384 (0.871)***	1.834 (1.146)	1.361 (1.078)	2.445 (1.042)**	1.402 (0.975)	0.736 (0.961)
at bats	3.066 (0.279)***	3.230 (0.193)***	3.350 (0.293)***	3.027 (0.393)***	3.080 (0.448)***	2.965 (0.440)***
age	0.030 (0.020)	0.013 (0.016)	0.004 (0.022)	0.001 (0.014)	−0.021 (0.013)	−0.033 (0.011)***
BMI		0.176 (0.053)***	0.211 (0.052)***		0.154 (0.060)**	0.177 (0.062)***
bat_right			0.274 (0.119)**			0.537 (0.125)***
team fixed effects			included			included
n	104	104	104	102	102	102
pseudo R^2(%)	49.05	54.49	57.56	44.14	48.13	51.34
panel II: runs-batted-in estimated via Poisson regression						
intercept	−5.132 (0.337)***	−6.025 (0.484)***	−5.652 (0.525)***	−5.273 (0.836)***	−5.970 (0.644)***	−5.728 (0.656)***
fWHR	1.104 (0.187)***	0.562 (0.298)	0.275 (0.235)	1.011 (0.383)***	0.669 (0.474)	0.402 (0.513)
at bats	2.494 (0.084)***	2.533 (0.095)***	2.500 (0.086)***	2.486 (0.124)***	2.507 (0.092)***	2.499 (0.083)***
age	0.010 (0.007)	0.003 (0.004)	−0.003 (0.005)	0.019 (0.006)***	0.011 (0.007)	0.009 (0.008)
BMI		0.078 (0.010)***	0.086 (0.009)***		0.059 (0.021)***	0.065 (0.024)***
bat_right			0.206 (0.062)***			0.101 (0.069)
team fixed effects			included			included
n	104	104	104	102	102	102
pseudo R^2(%)	71.09	72.99	74.14	66.90	68.01	68.55
panel III: slugging percentage estimated via ordinary least-squares regression						
intercept	−0.102 (0.165)	−0.220 (0.210)	−0.191 (0.209)	−0.074 (0.101)	−0.158 (0.110)	−0.176 (0.114)
fWHR	0.131 (0.049)**	0.105 (0.058)	0.107 (0.052)	0.136 (0.061)	0.114 (0.058)	0.091 (0.052)
at bats	0.094 (0.017)***	0.091 (0.015)***	0.090 (0.016)***	0.077 (0.014)***	0.076 (0.015)***	0.076 (0.016)***
age	0 (0.002)	−0.001 (0.002)	−0.001 (0.002)	0.000 (0.001)	−0.001 (0.001)	−0.001 (0.001)
BMI		0.007 (0.002)**	0.007 (0.003)		0.005 (0.003)	0.007 (0.003)
bat_right			−0.005 (0.017)			0.017 (0.015)
team fixed effects			included			included
n	104	104	104	102	102	102
R^2(%)	29.75	32.88	36.82	24.59	26.13	31.01

$^{**}p < 0.05$, $^{***}p < 0.01$.

impacted by the inclusion of batter handedness and team effects as shown in columns (C) and (F).

Column (A) in panel III of table 1 reveals a positive and statistically significant association between fWHR and slugging percentage in the 2011 season [1], but the inclusion of BMI in column (B) renders the coefficient on fWHR insignificant. Neither fWHR nor BMI exhibit statistically significant associations with slugging percentage after including controls for batter handedness and team fixed effects in either the 2011 or the 2012 season.

Collectively, these results suggest body mass, not the fWHR, predicts Japanese professional baseball player performance. Given both fWHR and BMI share a common link with testosterone [11,12], one interpretation is that BMI represents a sharper proxy for operationalizing testosterone levels.

A second interpretation of these results is that for purposes of assessing physical strength, BMI is more diagnostic than fWHR. This implication would be important in settings where the outcomes depend heavily on physical strength, such as home run hitting. Given the correlation between fWHR and BMI in the sample analysed here is relatively modest at 0.218, fWHR probably contains information beyond BMI. For example, fWHR has been shown to signal cooperative ability [13] and trustworthiness [14] in males. In settings where outcomes pertain to cooperation and trust, BMI may play no role at all.

A third interpretation is that associations between fWHR and performance occur by chance [7,15]. Assessing the validity of these various perspectives is possible with additional data collection and analysis. Identifying the particular settings and conditions under which fWHR is a meaningful predictor of outcomes remains an important research objective given the laboratory evidence demonstrating that fWHR is a reliable cue to human behaviour [13,14,16].

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